

Gray (L.B.)

THE EFFECT

OF

Dr. James R. Wood,

GENITAL IRRITATION

IN THE

With the kindest

Production of Nervous Disorders.

Regards of his old

pupil, the Author.

By LANDON CARTER GRAY, M.D.,

OF BROOKLYN,

LECTURER ON DISEASES OF THE NERVOUS SYSTEM, AND UPON THE ANATOMY
AND PHYSIOLOGY OF THE NERVOUS SYSTEM, LONG ISLAND COLLEGE HOS-
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YORK MEDICO-LEGAL SOCIETY.

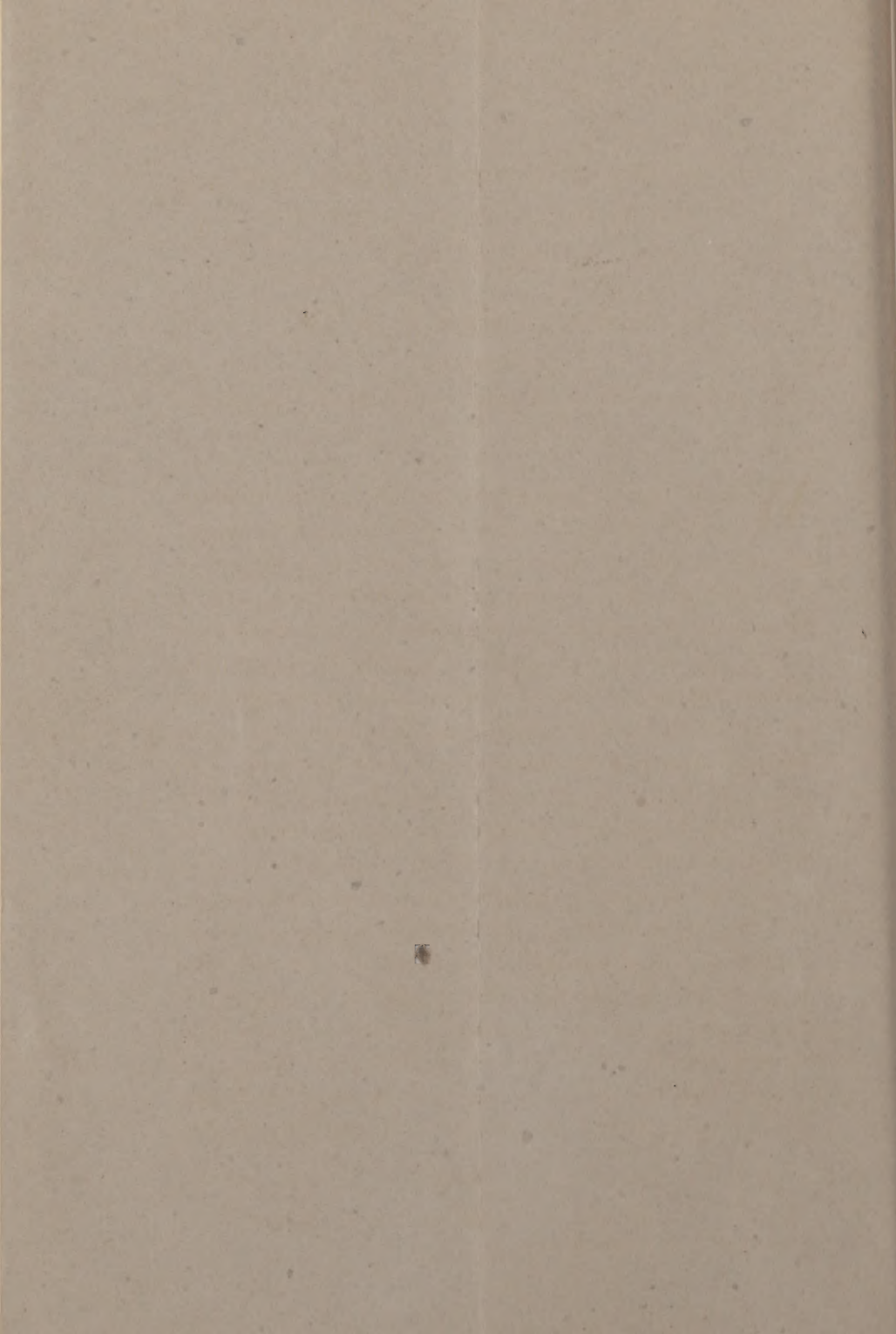


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THE EFFECT OF GENITAL IRRITATION IN
THE PRODUCTION OF NERVOUS
DISORDERS.¹

By LANDON CARTER GRAY, M.D.,

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WE are apt to forget how easy it is to start a fashion in medicine. Let any one—if he be of eminence, so much the better—advance a new opinion, in support of which he shall cite cases that contain sufficient truth to give them an air of value at first sight, then let him make some earnest and confident assertions of opinion, he who deludes himself carrying, of course, infinitely more conviction than he who merely deludes others—and the thing is done. The journals, hungering for novelties, circulate the news. The profession itself, I am tempted to say almost in proportion as it is intelligent and studious, has a strong tendency to mistake novelty for progress. From hospitals and clinics come manifold seeming confirmations. It may even happen that the original writer is outdone, and lengths are easily reached that were far beyond his vision. A warning voice may here and there be raised, but it must be of authority to create more than an echo, and even then it may fail to effect its purpose. So the discovery advances on a royal road, swelling with the bulk of success at every step. It is difficult to stay it. It is always difficult to dislodge an idea from

¹ Read before the New York Neurological Society November 1, 1881.

the aggregate mind of a mass of men, especially of professional men; but when it has stolen in under the guise of science or art it is likely to be guarded with a particularly jealous care. Being in possession, it holds on with the tentacles of mental habit; many observations have been adduced in proof of it; the refutations come late and are few in number as compared with the confirmations; the confirmations have perhaps taken possession of a thousand minds, whilst the refutations may make an uncertain impression upon a hundred; many who have publicly announced their belief keep secret the lack of faith that may come to them; there are few who possess the habit of mind that would lead them to critically weigh the evidence, and fewer still who will trouble themselves to do this weighing. So Error, fleet-footed, speeds its way, while Truth comes tardily after, if it come at all.

The history of the question of reflex paralysis is an illustration of this course of events. And here let it be premised, before we plunge into the thick of our subject, that by reflex paralysis is meant one dependent upon irritation of some peripheral nerve, either of the internal or external tissues, which is attended by no structural alterations of the nervous centres visible to the microscope, and which is relieved by the removal of the irritation. This is, of course, a somewhat arbitrary limitation of the term, although it is sanctioned, I believe, by the tacit unanimity of all the authors.

Some of the older writers, whose works are curiosities to-day, have written passingly of cases of this kind, which they attributed to lesions of the sympathetic.¹ But the really initial paper upon this subject was the celebrated one published by Mr. Stanley in 1833.² He had collected

¹ Thus Joseph Franck, Helmstedt, 1750, quotes Conrad Fabricius; Whytt (observations on the Nature, Causes, and Cure of the Disorders which were commonly called Nervous, Hypochondriac, Hysteric, etc., Edinb., 1767) has some remarks; also, Prochaska: *Institution physiologiæ humanæ*, vols. i. and ii. Vienna, 1806.

² Urinary Paraplegia. *Medico. Chir. Transact.*, vol. xviii, 1833, p. 260.

a number of instances in which disease of the kidneys or urethra had been accompanied or followed by paralysis and other grave nervous disorders, in some leading to a fatal issue. Marked lesions being found in the genito-urinary apparatus, and none being apparent to the naked eye in the spinal cord, he concluded that the nervous symptoms were of a reflex nature. His theory was probably based upon the writings of Marshall Hall, which had just been published with illustrative cases, upon the excito-motor or reflex functions of the cord. Mr. Stanley did not wait long for followers of distinction. Rayer, in France; Hensch and Romberg in Germany; Holland and Graves in Great Britain; then Notta, Leroy d'Etiolles, Esnault, Landry, Macario;—from these authors came a number of instances of paralysis seemingly caused by genito-urinary disease, intestinal troubles, worms, even pleuritic and pulmonary affections.¹ Comhaire brought physiological aid to the cause by his assertion that removal of a kidney from a dog caused paralysis on the same side.² It was not until 1856, twenty-three years after the publication of Stanley's paper, and after it had met with general professional acceptance in the three most civilized countries of the world, that a capable, virile critic arose in the person of W. Gull, now Sir W. Gull, to call attention to the fact that Stanley's

¹ It is perhaps unnecessary, at the same time that it is exact, to give the precise references to these names:

Rayer. *Traité des Maladies des Reins*, vol. iii.

Hensch: quoted in Leyden, *Klinik der Rückenmarks-krankheiten*, II. Bd. 1ste Abth. S., 215.

Romberg. *Lehrbuch der Nervenkr.* 1846.

Dr. Calvert Holland. *Edin. Med. and Surg. Journ.* 1845. Vol. lxiii., p. 325.

Graves: *Clin. Lectures on Pract. Med.*

Leroy d'Etiolles: *Des Paralysies des Membres inférieurs*. Paris. 1856.

Esnault. *Des Paralysies Symptomatiques de la métrite et du phlegmon utérin*. Paris. 1857.

I have not been able to obtain these two latter monographs.

Macario: *Union Méd.* 1859, p. 276.

Notta: *Archives de Méd.* Nov., 1854, p. 556.

² Sur l'exstirpation des reins. Paris. 1840. (I know of this work only by quotation.)

cases were utterly worthless as proof of reflex paralysis. Mr. Gull wrote still more forcibly upon the subject again in 1861, in a paper which Dr. Weir Mitchell very properly designates as brilliant.¹ In both these communications he pointed out, what it should seem might have been at least suspected half a century ago, that marked lesions of the cord might exist without being apparent to an eye unarmed with a microscope; moreover, that, even according to Mr. Stanley's own statements, several of the cases reported did present some evidence of gross disease of the cord or its membranes; and, finally, an instance is related in which gonorrhœa and syphilis were followed by paraplegia, terminating fatally, when the cord, macroscopically sound, was found to have undergone "a fatty degeneration" below the sixth dorsal vertebra. The tide of opinion now turned in the opposite direction—whether from the example set, or from the more extended study of nervous disease with the microscope, or from both causes combined, it would be difficult to say after this lapse of time. Jaccoud followed in the same sceptical vein in France.² Hasse and Valentiner raised their voices in protest in Germany,³ and Romberg formally abandoned the theory of reflex paralysis in the third edition of his work. Leroy d'Etiolles⁴ extirpated the kidneys of dogs without the supervention of paralysis, thus flatly contradicting Comhaire. Kussmaul⁵ had the good fortune to make a post mortem examination of a man who became paraplegic during chronic cystitis, and in whom he

¹ W. Gull. *Medico. Chir. Transac.* 1856. Vol. xxxix., p. 195. *Guy's Hosp. Rep.* 1861.

² Jaccoud. *Les Paraplégies et l'ataxie des mouvements.* Paris. 1864. P. 353.

³ The writings of these two gentlemen seem to be rather mythical, for, although they are alluded to by many, no one gives a reference, and I have been unable to lay hand upon their articles.

⁴ *Op. cit.*

⁵ *Würz med. Zeitschrift*, iv., p. 56, 63. (I know this only from the quotations in Leyden and Jaccoud.)

found atheromatous degeneration of the hypogastric arteries and fatty transformation of most of the nerve tubules of both sciatics. Leyden reported two interesting cases of paralysis, seemingly caused by vesical disease, in one also accompanied by long-standing urethral strictures, and in whom the cord was intensely and extensively softened, there being also cerebral foci of disease; the myelitis, too, had begun at the points of exit and entrance of the vesical nerves. Weir Mitchell, in our own country, made clear, by a searching analysis of the various cases, that there was grave doubt as to whether the genito-urinary lesions in many of them were not the *results* or *accompaniments* of spinal disease, instead of being the *causes*.¹ Notwithstanding this long array of proof in contravention of Mr. Stanley's conclusions as to reflex paralysis from genito-urinary disease, M. Brown-Séquard steps forth, as late as 1873,² as a champion of the old doctrine, cites all the old histories, and gives minute directions for the recognition of this particular form of palsy. But this has been a mere episode in the march of science. Tiesler,³ Feinberg,⁴ and Klemm⁵ have demonstrated, by experiments on dogs and rabbits, that neuritis of the sciatic nerve, induced artificially by caustics and irritants, can set up myelitis, and peri-pachymeningitis, which is often extensive, in one instance reaching to the cerebrum; and at the present day all the leading writers on nervous diseases have almost entirely discarded the older views, some of them admitting rare exceptions, it is true, but exceptions which constitute an exceedingly

¹ *N. Y. Med. Journal.* 1866. Part second.

² Lectures on Diag. and Treatment of the Principal Forms of Paralysis of the Lower Extremities. Phila. Lippincott & Co. 1873.

³ Ueber Neuritis. Königsberg. 1869.

⁴ Ueber Reflexlähmungen. Berlin: *Klin. Wochenschr.* 1871, No. 41, and 1874, No. 44-46.

⁵ Ueber Neuritis Migrans. Strasburg. 1874.

meagre outcome of the claims that have been made in the past.

In this country the question has assumed a different phase during the last decade, owing to the energy and widespread reputation of a New York physician. In the cases of which we have been speaking the alleged cause of the paralysis was in the kidneys, bladder, prostate, urethra, uterus, or intestines. Dr. Lewis A. Sayre, in two articles, one published in 1870, the other in 1875,¹ has claimed that phymosis, adherent prepuce, and irritable clitoris, are frequent causes of paralysis in children, of retention of urine, and of many slighter nervous disorders. Dr. I. Baker Brown, of London, had before this set the medical world of England by the ears concerning the value of clitoridectomy for the relief of epilepsy, hysteria, catalepsy, etc., and had provoked a furious discussion, partly medical, partly ethical, that culminated in his trial before the Obstetrical Society of London, his expulsion therefrom, and his resignation from the London Medical Society—harsh measures, doubtless, which could only have been taken in consequence of grave indiscretion on the part of the accused, or because of great intolerance on the part of his accusers.² Mr. Thomas Bryant, in 1868, had narrated the histories of eight cases of urinary difficulties in childhood from elongated and adherent prepuce.³ In 1872 Barwell followed with the narrative of two cases of paralysis in children claimed to have been relieved by circumcision.⁴ Dr. Otis, of New York, has supplemented Dr. Sayre's second paper with several interesting

¹ *Transact. Amer. Med. Assoc.*, vol. xxi, 1870, p. 205; and vol. xxvi, 1875, p. 255.

² Vide his work: *On the Curability of Certain Forms of Insanity, Epilepsy, Catalepsy, and Hysteria in Females*. London: Hartwicke. 1866. Also discussion on clitoridectomy through 1866 and 1867, in *Lancet*, as well as an account of his trial.

³ Congenital Phymosis, *Med. Times and Gazette*, May 10th, 1878.

⁴ *Lancet*, 1872, p. 551.

histories of nervous irritations thought to have been caused by this genital lesion.¹ The matter has attracted widespread attention, so much so that one would be thought to be lacking in precision did he not examine the genitals in all cases of slight nervous disturbance. Some enthusiasts have carried the matter so far as almost to look upon circumcision as a panacea, and one well-meaning gentleman of my acquaintance, who had charge of a general clinic several years ago, made such slaughter among the innocents that the mothers of his section of the city ceased bringing their male children to him. Another gentleman even, as we shall learn later, believes that he has relieved cerebral softening by circumcision, as he was courageous enough to say, ten years before, that he had cured a general paralysis with insanity in the same manner. A matter that, to use Bacon's familiar phrase, thus "comes home to our businesses and bosoms," merits critical examination.

In the first place, then, what evidence is there that genital irritation causes paralysis? For proof of this we must seek Sayre's² and Barwell's³ cases.

In Dr. Sayre's first paper six cases are given:

CASE I. Boy, very white and delicate, aged 5 years, unable to walk without assistance, or to stand erect. Knees flexed at about angle of 45° . When child's attention was turned to something else, very little force could extend the legs normally, but they returned to the flexed condition as soon as the hold was released. No irritation of the quadriceps could extend them except slightly. Elongated, very tight and firmly adherent prepuce, meatus as inflamed as in a severe granular urethritis, and upon touching the urethral mouth an orgasm and slight convulsion were produced. Child frequently awoke in the night complaining of the pain in the penis, which was also evoked by the friction of his clothing in riding. Circumcision and adhesions loosened. In less than two weeks the

¹ These can be found at the end of Dr. Sayre's last article, cited above.

² Op. Cit.

³ Op. Cit.

wound had healed. Improvement in the general health from the day of operation, and at the end of two weeks could extend his limbs perfectly straight while lying on his back, and in five weeks could walk with limbs quite straight, being discharged as cured about a week after.

The history is incomplete, as nothing is stated about the duration of the trouble, its onset, whether there was a return of the symptoms after discharge, and there is nothing to indicate that the patient was examined for organic nervous disease; but so far as the history goes, it would certainly seem to be that of a delicate child whose penis was in an unusually and painfully inflamed condition, who instinctively flexed his legs to relax the strain of the abdominal muscles and keep away the clothing from the inflamed part, and who would not walk because of the suffering thus entailed. Considering his youth and the agony he must have endured, it is by no means remarkable that a week passed after the healing before he would venture to stretch his legs, and three before he would walk alone.

CASE 2. Boy, *æt.* 14, paralysis of lower extremities for about four months. Phymosis. Circumcision done. Symptoms entirely relieved.

Nothing is said about the degree of the paralysis, or as to whether it might not have been due to organic changes or other causes that could have passed away in four months.

CASE 3. Boy, aged 15. Said to have had "nervousness and fainting fits," as well as "weakness and neuralgia of the legs, which caused him to trip easily and fall." Fits once or twice daily, slightest irritation of the penis produced painful erections. Phymosis. Up to six weeks after circumcision he had no return of the fits, but nothing is said as to the effect of the operation on the legs.

History very incomplete; no proof that paralysis was due to genital irritation; and if the "fits," which are not described, were epileptic in their nature, it would be quite

probable that circumcision in the case would cause them to cease temporarily.

The histories of three other children are given in a general way in this first article of Dr. Sayre's. Three little boys, aged respectively 7, 9, and 13 years (cases 4, 5, and 6), were brought to him in the second stage of hip-joint disease. They were said to have been clumsy boys, and to have been "tumbling down all the time." Phymosis was found in all three cases, and irritable penes. Circumcision, to use Dr. Sayre's own words, "at once quieted their nervous irritability." This is absolutely all the history given. We are not informed whether they were suffering from spastic-spinal paralysis, such as has been described by Erb¹ and Seguin,² whether it is meant that their irritable penes were relieved or their habit of stumbling, or whether the improvement was permanent.

Dr. Sayre gives the following cases in his second article:

CASE 7. Boy, 3½ years old. "Has frequently through the day what the mother terms 'spasms of ecstasy,' in which he laughs immoderately, and his eyes are bright and glistening, but yet he apparently sees no object, and the penis is in a state of extreme erection." Cannot see, although eyes have been examined and found sound. "Unable to stand; incapable of voluntarily contracting any of his muscles when standing, or rather when being held in the upright posture, as it was impossible for him to stand, but when lying on his back for some time can move his hands and can turn over; but when held upright his legs always spasmodically cross each other, hands close, wrists flex, elbows the same; in fact, all the adductor and flexor muscles act and produce a strange distortion: the mouth opens, and there is a vacant stare of idiocy with a curious laugh of half intelligence. The penis is in a state of almost constant erection, and greatly excited at the least irritation. The meatus is red and tender. Teeth nearly all destroyed by medicine, and is now nourished on a

¹ Ueber das Vorkommen der "spastischen spinallähmung" bei kleinen Kindern. *Memorabilien*, 1877. 12 Heft.

² *Arch. of Med.*, February, 1878, p. 80.

bottle." Phymosis, firmly adherent prepuce. Dr. Sayre circumcised him on the spot; and at the next visit the child shook hands with him, which he had never done before in his life. Considerable improvement is said to have followed, but not a cure, as about eight months afterward "it could not hold its head up with the strength of the normal child, although it could sit down and get up and stand balancing itself without assistance; could speak several words, and had acquired the power of eating."

This was very evidently a well-marked case of spastic disease, from what cause cannot be determined from the meagre history; but there is no proof that it arose from the genital irritation, and it is undecided as to how much of the improvement was due to the circumcision, how much to the cessation of the vigorous dosing that had destroyed the teeth, and how much to the inherent tendency of the disease itself.

CASE 8. Boy, *æ*t. 2. Eight months before had slight fever for a few days, then paralysis of lower extremities, most marked in left leg. Both lower limbs weak, left the most so. Half an inch atrophy of left leg. Muscles respond to electricity. Congenital phymosis. Improvement at once, and about three weeks after is said to have gained perfect use of limbs. Electricity was used daily soon after operation.

This was probably a case of myelitis of one anterior cornu, which was probably in a convalescent stage, at which such cases can be improved by circumcision, as I shall endeavor to show in due time, and which was probably greatly aided by the electricity.

CASE 9. Female, *æ*t. $3\frac{3}{4}$. Delivered by forceps. Unable to keep the body erect; could not roll over. Cannot stand; adduction of both lower limbs, which cross one another. Adductors and tendones Achillis tense. Clitoris is red; touching it excites spasm of thighs. Clitoris removed. Some slight improvement two days after, but it could not have caused much elation, because the tendones Achillis were cut on the third day and the child placed in a wire cuirass; next—how long after the history does not state—the adductors on either side

were divided, and the legs kept abducted by two iron rods ; finally, electricity and a wheel-crutch are brought into play, although we are assured that "the girl moves her limbs more readily, has more power over her body, and contraction at the knee daily lessening."

This was probably a case of meningeal hæmorrhage, such as not infrequently occurs from forceps delivery, with secondary degeneration of the lateral columns of the cord. We can hardly be expected to regard the red clitoris as the cause.

CASE 10. Retention of urine from paralysis of bladder, in man of 54 years. Phymosis. Catheterized on first day, again on second, and then circumcised. On third day passed his water voluntarily, and is said to have done so ever since, although there is nothing to show that Dr. S. ever saw him again, as he was a hotel patient.

This case requires no comment.

CASE 11. Male, æt. $3\frac{1}{2}$. Some lameness of right leg ; trips and falls. *Very slight pain on complete abduction and eversion of the right thigh.* Extension, adduction and flexion perfect ; penis large, extremely erected ; "prepuce firmly adherent to the glans around urethral orifice, drawing it open when organ was erected." Circumcision, and alleged cure in short time.

The history is too incomplete to enable us to decide whether this lameness, which was apparently but slight, was due to pain in penis caused by certain muscular movements, as of abduction and outward rotation of the thigh, or whether the case was one of previous myelitis of the anterior horns, which had left this residue of paresis to be relieved by the circumcision, or whether the paresis was really caused by the genital irritation.

CASE 12. Case of asserted paralytic club-foot, about which Dr. Sayre was written. Phymosis, with adhesions. Circumcision is said to have effected distinct improvement.

Not enough of the case is told us to warrant any conclusions.

CASE 13. Idiocy, spastic contraction of lower limbs. Clitoris very red and irritable, touch upon it causing spasm. No age given, or any other details whatsoever. Clitoris clipped and cauterized, and wire cuirass applied. Nutritious diet and tonics ordered.

The history is certainly not precise enough to establish a new or decide a contraverted point.

CASE 14. Double varo-equinus, congenital, in child of 3 years. Mechanical treatment applied since child four months old. "Feet were readily replaced in normal position by the hand, but immediately returned to their deformed posture when the support was removed. Phymosis. Circumcision. Two weeks after child could stand flat upon his feet, with some inversion of left great toe.

Although this does seem at first sight to have been a paralysis due to the phymosis, the removal of which seems to have cured it, yet in strict justice it must be borne in mind that it is not proven that it was not originally of organic or other origin, nor that it was not due to the enforced rest of the prolonged mechanical treatment, and, moreover, no mention is made of the subsequent progress.

In the appendix to his second article, Dr. Sayre adds these cases :

CASE 15. Male, $3\frac{3}{4}$ years. Increasing feebleness of lower limbs for a year. "Could not stand without support, and even when supported his legs would bend in different directions." Phymosis, firm adhesions, which needed to be cut. Entirely well at the end of twelve days.

This does certainly look like a paralysis from adherent prepuce, and I should believe it to be so if a full history did not contradict this scanty one.

CASE 16. Male, $3\frac{1}{2}$ years. Became lame in left leg when one year old. Atrophy of left leg at time of examination. Child falls continually. Foot everted. Iron brace is worn on outside of leg. Phymosis. Circumcision. Five days after walks without a brace, does not fall down, and ran round the room for first time in two years.

How long had the limb been confined in the brace? And how can we determine how much relief came from the circumcision and how much from removing the brace?

CASE 17. Reported to Dr. Sayre by letter from Dr. J. H. Adams, of Texas. It is simply the case of a gentleman of 27 who had had a large portion of the cutaneous surface of his penis behind the corona removed by some enterprising surgeon as a substitute for circumcision, in whom a dense cicatricial band formed at the site of the operation, who suffered great pain from it, and "whose locomotion," very probably for this latter reason, "became impaired." Incision of the band relieved him.

CASE 18. Reported by letter from Dr. T. F. Leech, of Indiana. "Paralysis of lower half of body; also spinal irritation" (?). Of this patient the doctor writes: "Mr. John McGuire and wife, of our town, have but one child, a boy of fourteen months, who has been the terror of all this part of the town for six months, as he cries continually, except when asleep or nursed by his mother. He would lay perfectly quiet and squall!" This unpopular infant had phymosis and an adherent prepuce, as might have been expected; and was circumcised, as was proper. Three days later he was said to have "made marked improvement, and bids fair to make a rapid and complete recovery."

We are not told whether he made that recovery, and the history is too indefinite to permit of any deductions.

CASE 19. This seems to be rather a case of choreiform or chronic movements, said to have been relieved by circumcision, and is not germane to this part of my paper.

Dr. Barwell reports two cases:¹

CASE 1. Boy, *æ*t. 4. He had seemed ailing and fretful for a week before his mother noticed some impairment in his gait. At times becomes lost in thought, as it were, and has then a vacant stare. Phymosis, adherent prepuce. Circumcision. In a few days child is said to have walked as well as ever.

There is nothing to indicate that the possibility of organic disease was considered.

¹ Op. Cit.

CASE 2. Girl, *æ*t. 5. Paresis of one leg of few months' duration. Sometimes worse, sometimes better. *Ascarides* removed, and a vaginitis treated, and the child improved, but the leg was still atrophied three months after.

Manifest to all men must be the objections to this history.

To sum up, there have been twenty cases in all reported of alleged paralysis from genital irritation. In not one is the proof conclusive of this relation between cause and effect. In two cases there is some proof, but it is not sufficient (cases 14, 15). In two cases there was probably impaired locomotion from the pain of the irritated genitals (cases 1, 17). One patient had probably had meningeal hæmorrhage during foetal life, and secondary degeneration of the lateral columns of the cord (case 9). Another was probably epileptic (case 3); another suffering from some spastic disease (case 7); still another from myelitis of one anterior cornu (case 8), and in twelve the histories were too indefinite to render any opinion justifiable (cases 2, 4, 5, 6, 10, 11, 12, 13, 18, and Barwell's two cases).

I have taken the trouble to address letters to Drs. S. Weir Mitchell, J. M. Da Costa, A. Jacobi, J. S. Jewell, Robert T. Edes, F. T. Miles, S. G. Webber, E. C. Spitzka, E. C. Seguin, F. P. Kinnicutt, T. A. McBride, asking them if they had ever seen a case of paralysis from genital irritation, in which the proof of the facts was conclusive. They have all courteously answered me, and positively in the negative. Dr. Newton M. Shaffer has expressed the same opinion in a late article; and Dr. William A. Hammond has never seen a case resulting from preputial irritation.

In view of the foregoing data and the acknowledged standing of these gentlemen as neurologists, the conviction is irresistible that genital irritation cannot cause paralysis, or does it very seldom. My personal experience, I may perhaps be permitted to say, is in accordance with that of my correspondents.

Yet there is good reason to believe that the operative procedures necessary to the relief of phymosis and adherent prepuce often cause considerable temporary improvement in cases of organic nervous disease, especially in the later periods. This is exemplified in cases 7, 8, 9, of Dr. Sayre's papers, and in Barwell's first case. Dr. C. Fayette Taylor tells of a boy about 2 years old, evidently a post-diphtheritic paretic, who was circumcised by Dr. Fruitnight because of phymosis and adherent prepuce, and who derived great benefit from the operation.¹ I have had four curious cases of this kind in my own practice.

CASE 1. Boy, about 3 years old, in whom a diagnosis of tubercular meningitis was made. His prepuce was long, tight and firmly adherent. I was curious to learn what effect circumcision would have upon him, and accordingly performed the operation. He at once began to sleep so much better, his irritable temper decreased so much, his appetite was so greatly improved, he seemed so much more intelligent, that I should have doubted the correctness of my diagnosis had not the symptoms resumed their former intensity in the course of the second month, and had not an autopsy, some seven months afterward, displayed to me a tuberculous meningitis.

CASE 2. Boy $2\frac{1}{2}$ years old, who about a year previous had been confined to bed with slight fever for several days, then was paralysed in left leg, which shortly afterwards began to waste. Nocturnal incontinence. Drags left leg greatly in walking. Farado-contractility of the anterior tibial and calf muscles of this leg almost nil. The galvanic reaction was ascertained at the time, but no note was made of it, although I feel certain that it was the "reaction of degeneration" (Entartungsreaction). Diagnosis: Myelitis of one anterior cornu. Long, tight and slightly adherent prepuce. After treatment with tonics, good diet, and electricity for four months without marked effect, circumcision was done. The improvement in the general health and in the strength of the leg was marked, the dragging gait diminishing to a slight halt, and at this date, ten months after, the improvement has been maintained.

¹*Annals of Anatomy and Surgery*, Vol. iv., No. 1, July, 1881, pp. 4 and 48.

CASE 3. Male, 23 years old. Fine, rhythmical tremor, on excitement and voluntary movement only. Diplopia about three to four months ago. Tremor confined to upper and lower extremities, not in the head or neck. Tendon-reflex normal. Worker in a brass factory for seven years, where he is surrounded by a fine dust of brass filings. On excitement his voice fails him. Diagnosis: Tremor, of disseminated sclerosis type, from brass poisoning. Phymosis and adherent prepuce. After six weeks' treatment by the iodide of potash and the wearing of a wire respirator, the tremor greatly improved, but was still perceptible. He was then circumcised, and from that day forwards for upwards of two months, when I lost sight of him, he had no return of the tremor.

CASE 4. Male, aged 14. Is subject to attacks which commence by extension of right extremities, to which succeeds a tremor of them, and, when this has lasted for quite an interval, there ensues a tremor of the whole body. About half the time there would be a loss of consciousness, when the muscular movements would be more severe, and would be followed by deep sleep. At times, after one of the conscious spells in the night, patient would cry for a long time, although, as he says, "I knew I was crying, but I had to cry on, as I could not stop." He would frequently walk about his room after an attack in a somnambulistic state. These fits would come as often as ten to fifteen times daily. Diagnosis.—Epilepsy, of the Hughlings-Jackson type. This condition had begun in 1874. On October 9th, 1874, I circumcised him because of phymosis and adherent prepuce. At first the fits were only slightly decreased in number, though not so severe; but in about ten days they ceased, *none appearing from October 27th to December 16th, 60 days*, when they slowly reappeared, one to three coming every three or four days, until they resumed their former severity and frequency by the middle of January.

The bromides have a curious effect on this patient, which it is proper to speak of in this connection. They make him much worse, at times almost maniacal, after prostrating him physically to an alarming extent; *but after they have been stopped he is always free from any of his nervous symptoms for a period varying from one to two months and a half.*

Where a genital irritation is removed by operation, we

have several factors at work that may be potent in effecting improvement. The patient usually obtains rest, as has been suggested by Dr. Shaffer, but this is usually short, in my own cases not extending over twenty-four or forty-eight hours, and is, therefore, obviously inadequate. An irritant is removed from an exquisitely sensitive organ, one so sensitive that the deepest stages of ether and chloroform narcosis must be reached before anaesthesia of it is produced. The profound impression upon the nervous system of etherization or chloroformization must be considered: those who have seen, as I have, an inveterate and unmanageable *tic douloureux* greatly relieved for two or three days by alcoholic intoxication, and other like phenomena, will not question this. Conjointly with this cause, inseparable from it as most of the operations are done, is the impression upon the nervous centres of the cutting or tearing or cauterizing of the operation itself. The more unstable, the more impressionable the nervous system be, whether from actual disease or from heredity, the more active will these three last factors be, particularly the latter two. I have seen a confirmed epileptic, having convulsions every day or two, of strong kleptomaniac tendencies, go for six weeks without a fit and not steal, after having had a depressed cicatrix removed from the scalp, the bone being sound beneath this cicatrix and no nerve being implicated in it. Our therapeutics takes too little account, in my opinion, of these impressions. Your nerve centre cannot itself be directly reached except by great violence. - It usually lies deeply encased in bony cavities, and its only means of communication with the outer world is through nerve fibres. Precisely as the outspread panorama of a landscape passes to the cortical cells along the optic nerve; precisely as the music of an opera reaches the cerebrum upon the auditory nerve; precisely as the fragrance of flowers steals inward through the olfactory

nerve; so, in the same manner, do the differences in barometric and thermometric pressure, and cutaneous and visceral impressions of any kind make themselves known to the central ganglia by way of the sensory spinal and cerebral nerves. For what other reason do we slap or dash water upon a new-born babe who fails to make the usual respiratory movements? It is well known to physiologists that a frog can be killed by a smart blow upon the belly. When a man becomes livid, pulseless and dazed from a bullet-wound, before hæmorrhage has had time to do its work, it is the nervous centres that are shocked by the peripheral violence. When gun-shot wounds induce disturbance in distant nerves, as has been shown in the celebrated circulars of Drs. Mitchell, Morehouse, and Keen, they act through the medium of the central ganglia. This impression upon nervous centres is a factor, and an important one, throughout the whole extended range of the complex phenomena of life. It is inseparable from the action of all drugs, whether they be brought in contact with the alimentary canal, with the skin, or with the subcutaneous tissue. Who has estimated its relative performance in the effects obtained from cathartics, from cholagogues, from irritants, from sedatives, from stimulants, from tonics, from electricity? Who has told us what part it plays in change of locality, not merely from one climate to another different one, but from one neighboring town to another, or even in the removal from one story of a house to another, such as occasionally gives relief to asthmatics? Wherever there be nerves of sensation, there we *must* have it; and, in neglecting it as we have done, we fail to make use of a rich and well-worked mine of material lying ready to our hand.

The fact that operations upon the genital organs will, for the time being, ameliorate the symptoms of organic lesions

should make us cautious in accepting the conclusions to which we would otherwise be naturally led by the cases of Mr. Bryant and Dr. Otis. Although we must omit one instance narrated by Dr. Otis of a patient of M. Brown-Séquard, who was cured of symptoms of cerebral softening by circumcision, yet, undoubtedly the proof submitted by him and Mr. Bryant is unimpeachable in demonstrating that the removal of a phymosis, adherent prepuce, irritable clitoris, and urethral strictures will often relieve urinary incontinence, retention, intermittent and painful micturition, priapism, and a host of unclassifiable nervous symptoms, more especially in children. But, as these cases do not seem to have been thoroughly examined for organic nervous disease or other causes, and, furthermore, as their histories after the operation do not usually extend over a month or two, the data are wanting upon which any man can judiciously formulate an opinion that they might not have been cases of organic nervous or other disease, improved for a time by cessation of genital irritation.¹ Notwithstanding that Mr. Bryant would seem in his cases to have carefully excluded the possibility of stone or disease of the bladder, there is no evidence that Dr. Otis has considered these causes, and of both Mr. Bryant and Dr. Otis we may ask whether their patients had highly acid urine, or nephritis, or spastic disease, or meningeal troubles, especially the tuberculous, or spondylitis, or organic disease of any kind, or were of a neurotic heredity. To illustrate the facility with which even an alert observer can be misled in regard to deductions of this nature, I may perhaps be pardoned for the recital of the following case of Dr. S. Weir Mitchell, at

¹ Dr. E. C. Spitzka writes me that he has seen the prepuce in some way anomalous in eight cases of infantile spinal paralysis, and in all cases of paralysis from spinal disease in male children, and makes the interesting suggestion that it may be only one effect of the generally defective development.

the same time expressing my regret that the length of this paper forbids me giving the details in full.¹

L. P., male, æt. 6, a strong, healthy-looking child, whose father had had syphilitic accidents. No trouble in teething. Had had malarial fever, yielding to quinine. Was not quite well from this date, though no special disease apparent; was indisposed to action, lacked appetite, and woke often with a cry. A little later complained of stomachic pain, and two days after passed a large *ascaris lumbricoides*. Was given a vermifuge. On evening of same day fell down, had slight facial spasm, and became unconscious. On being roused after two hours of semi-coma, slight ptosis of left eyelid and partial motor paralysis of both legs were observed. Salines and vermifuge again ordered, causing expulsion of four worms and much slimy mucus; and thereupon he began to move legs freely and could stand with slight aid. During the next month he passed several worms, and at the end of this time was as well as usual, except a slight limp and slight ptosis. Dr. Mitchell at this time deemed it to be a case of palsy from worms. Remained improved for six months, *when he had a series of convulsions without apparent cause, ending in a much more complete paraplegia. Former vermifuge treatment had now no effect in expelling any more worms, "yet a persistent purgative course so far improved the boy that in three weeks he could stand, holding fast to a chair."* During the summer and spring he took iron and quinine, and was some time at the seaside. These measures completed his recovery so far, that "he seemed to me better than at any time since the first attack." Eight months after he had the convulsions again, followed by coma and motor and sensory paraplegia, the sensation improving in time, but not the motion. The former means of treatment now failed entirely, and no worms were discharged. Three years later he was in this same condition, and died of dysentery, two and a half years after this final attack of paralysis.

I am not prepared to deny that reflex paralysis may not occur from other cases than phymosis, adherent prepuce, irritable clitoris and meatus, and strictures. Nonat had under his care a young, unmarried woman, in whom

¹ Op. cit.

intra-uterine cauterization repeatedly produced loss of consciousness with momentary paralysis of the lower limbs, on one occasion even a complete anaesthesia of them. Echeverria, applying a mild faradic current to the cervix uteri for metrorrhagia, produced severe pain in the pelvis and lower extremities, tremor and numbness in the limbs, general perspiration and paralysis of the lower limbs, not completely recovered from until fourteen hours had elapsed. The secretion of milk, having ceased for five days, was reestablished.¹ I think I have seen a para-paresis produced in a little child by lying through the night on a rubber cloth, which had induced profuse perspiration, and it was relieved in a few hours by the withdrawal of the cloth; but I have no notes of the case, which occurred some eight years ago, and I may possibly be mistaken. We certainly know that reflex paralysis can be experimentally brought about in a limited way on the lower animals. Lewisson has produced paralysis of the hinder legs in rabbits by squeezing the kidney that had been laid bare, as well as by pinching the fore legs, or even by so slight a cutaneous impression in a frog as a rubber ring placed around the neck: this loss of power ceasing upon the removal of the cause, and, in addition, the discussion that has been waged of late years in regard to the existence and nature of inhibitory nervous actions has demonstrated that impressions upon certain nerves can restrain the action of others. Nothnagel,² for example, by gentle pressure upon the sciatic nerve stopped the strongly tremulous movements in the hind legs of a dog whose spinal cord had been severed in the dorsal region, and who had been suspended in the air. Strong pressure increased these movements.

¹ Both these cases are related by Echeverria, *N. Y. Medical Journal*, vol. iii, 1866, p. 98.

² Beobacht über Reflexhemmung, *Arch. für Psych. u. Nervk.*, vi, S. 332, 1875.

Tschirjew¹ temporarily abolished the tendon-reflex of the quadriceps extensor by lightly raising the crural nerve on a string.

The practical deductions from all these facts and reasonings are of great importance to us as scientific and conscientious practitioners. We should never, in any case, unless the future supplies the links in the chain of evidence that are as yet wanting, assume that nervous symptoms are due to a co-existing genital irritation. We should, in all such instances, carefully search for other causes, and it will be our imperative duty to do so in paralysis. We should examine for urinary acidity, stone, cystitis, nephritis. We should search for organic disease, as meningitis, particularly the tuberculous, spondylitis, tetanoid paraplegia, epilepsy, as well as for neurotic heredity and tendencies. But the genital irritation should be always removed, as we remove any other peripheral irritation. In regard to this particular point, Dr. William M. Mastin, of Mobile, sounds a warning note, which we shall do well to heed.² His father, Dr. C. H. Mastin, calls attention to the general, if not universal, prevalence among the Jewish males of contracted urethral meatus, which he attributes to their habit of circumcision, and the textural changes induced in the glans by the loss of the covering prepuce, analogous to the occlusion of the lacrymal puncta and incurvation of the tarsal cartilages in entropion. We should therefore be careful not to deprive the glans of its natural præputial shield to a greater extent than is absolutely necessary. Dr. A. Jacobi states to me in a letter that, after the adhesions have been broken up, he has succeeded, in a number of cases, in easily dilating the præputial orifice;³ and

¹ *Arch. für Psych., u. Nervk.*, viii, Hft. 2, and *Berl. Klin. Wochenschr.*, No. 1, 1878.

² *Annals of Anatomy and Surgery*, Vol. iv., No. 3, September, 1881.

³ Since the publication of this article and many of these reprints, I have been informed that Dr. J. C. Hutchison, of this city, had been in the habit of dilating the prepuce, as far back as 1868-'69, and has even devised an instrument for this purpose.

it will certainly be advisable to make use of this suggestion. In view of Dr. Mastin's assertions, we should be cautious about doing any other operation than for the removal of an irritation, although I believe that any operation upon the genitals will often have a beneficial effect for a longer or shorter time, and that therefore it may be proper to practice it, when the possible relief may counter-balance in importance the probable resulting stricture of the meatus.

I believe, then, that I am justified in asserting:

1. That there is no proof that genital irritation can produce a reflex paralysis.

2. That while it is probable that slight nervous disorders, as incontinence, retention, difficult micturition, erratic movements, and slight nervous disturbances can be produced by genital irritation, the proof is not yet complete.

3. That operations for the removal of genital irritation may be beneficial even in organic nervous disease.

4. That we should, therefore, remove such genital irritation, if it exist in any case whatsoever, and thus give our patients the benefit of the doubt.

5. That in all cases of nervous disorders, with accompanying genital irritation, we should not regard the latter as the cause of the former until all other probable or even possible causes have been rigidly excluded.

6. That operations upon the genitals, even when there be no genital irritation, may prove to be an useful therapeutic measure in certain cases.

Since the reading of this article, the *New York Medical Record*, in its account of the ensuing debate, has published some hitherto unpublished cases of Drs. Sayre and Seguin,¹ the details of which were not mentioned in the discussion.

¹ November 19, 1881, p. 576.

The first patient of the former gentleman had phymosis, preputial adhesions and also great weakness of the eyes. He was circumcised, and adhesions removed. It is said: "At the end of one month he was perfectly well." Dr. Knapp, in a letter which is given, writes: "His sight after operation had materially improved, both as to acuteness and capacity for prolonged use. He has still incomplete atrophy of the optic nerves, and moderate amblyopia." This, therefore, adds another, and a very interesting, case to those already cited in demonstration of the fact that operations upon the genitals will be beneficial in organic disease.

Dr. Sayre adds four more cases:

CASE 1. *Æt.* 31. Began walking when about one year old. No trouble till twenty months old, when he became nervous, moving hands and feet in a peculiar way, and making a strange noise. Passing water relieved these symptoms. Would sit still all day in a chair if left to himself, without noticing anything, or attempting to speak. Gait unsteady, fell easily. Prepuce elongated, orifice very small. Circumcision, adhesions torn away. Symptoms disappeared, and had not returned fifteen days after.

This patient was manifestly not under observation long enough to prove anything.

CASE 2. *Æt.* 6½. Partial paralysis of legs. Constant erections. Adhesions firm; they were removed August 20. On October 10 heard by letter of great improvement, and that legs could be extended or flexed without any effort.

Proof defective because fifty-one days is not long enough time for observation, and because we are not informed as to who wrote the letter or how accurate an observer he was.

Some cases of epilepsy are reported in a letter to have been free from fits since removal of adhesions, but no details are given, and we are not told how long they were relieved.

CASE 3. *Æt.* 18 months. Paresis of lower limbs. Adhesions firm, meatus red and granular. Adhesions removed. About one month after child well.

Time of observation inadequate.

CASE 4. *Æt.* 3½. Partial paralysis and atrophy of left leg, dating back to his twelfth month. Phymosis. Circumcision. Six months afterward child very much improved.

We are not told as to whether he had any other treatment in the interim; but certainly this looks like a case of organic disease, possibly myelitis of one anterior cornu, or neuritis, improved by circumcision, like my own case.

In the course of the debate, Dr. Sayre remarks: "Dr. Gray had intimated that in one case an apparent paralysis existed only because of the exquisite tenderness of the parts, which friction of the clothes increased. But if so, why could not the child move, as he could not, when perfectly naked?" This allusion was to case 1 of Dr. Sayre's original paper; and my answer to his question will be found in my comments, which he seems to have misapprehended, on that very case. A child, who had undergone the torments of this one, would very naturally not return to a normal condition upon a momentary removal of *one* irritating factor.

As my friend, Dr. Seguin, was not present at the reading of my paper, I fear that he was not fully informed as to the precise points that I attempted to establish, for his cases are confirmatory of my views. A running analysis of them will make this plain.

CASE 1. *Æt.* 18 months. Urinary incontinence of several months. Much elongated prepuce. Circumcision, January 15, 1876. Perfect relief to present date.

This is excellent proof of the removal of urinary incontinence by circumcision, but it is not stated that there was any genital irritation.

CASE 2. *Æt.* 8. Urinary incontinence for several years. Elongated prepuce and adhesions. Circumcision, April 16, 1880. Marked improvement one month after; then strychnia given and continued; at present well.

Improvement apparently due to operation; who can tell how much of cure due to strychnia?

CASE 3. *Æt.* 10. Constant pain in popliteal space, marked paresis of legs, headache, palpitation on least exertion. Adhesions extending to mouth of urethra broken down, April 15. June 22, perfect relief.

Subsequent history not extended enough to be conclusive.

CASE 4. Boy, *æt.* 19 mos. Cannot walk, standing difficult, head thrown back. May 6th, adhesions removed. May 20th, marked improvement, *although adhesions had re-united*; they were again removed. August 20th, child walks readily.

As re-union of adhesions did not prevent marked improvement, this latter must have been due to something else than the removal of adhesions, possibly to the operation, etc. History does not extend beyond fifty-eight days.

CASE 5. Boy, *æt.* 2. Great muscular debility of lower extremities. Prepuce elongated. Circumcised June 21, 1880. Improvement, but "this case has required constant care to the present time."

No proof here that paresis was due to phimosis, or was markedly benefitted by it.

CASE 6. *Æt.* 3. Cannot walk readily. Urinary incontinence. Removed adhesions and large amount of smegma. July 29, 1880. October 18, no return of incontinence. Walks much better.

As the walk was still defective nearly three months after the operation, it looks as if this defective walk and incontinence were both due to organic disease, and that one of

these symptoms had been relieved, at least temporarily, by removal of adhesions.

CASE 7. Boy, æt. 6. Very backward in walking, now weak in lower extremities ; urinary incontinence and inguinal hernia. August 5, 1886, adhesions and large amount of smegma removed. September 6th, much stronger, no return of incontinence.

The remarks upon case 6 will apply here.

CASE 8. Æt. 2½. Unable to stand ; very little power in legs. September 23, circumcision and removal of adhesions. October 31, child runs around readily.

History extends only over forty days.

CASE 9. Æt. 2. Paresis lower extremities, drags legs in walking. August 16, adhesions broken down. August 23, walks without dragging his legs. September 27, circumcised. October 4th, marked improvement. Gaiffe's battery was applied, and stated to have been beneficial.

Removal of adhesions caused improvement ; so did circumcision, although it is not said that it was necessary to remove any genital irritation ; so did Gaiffe's battery ; and, after all, it is not claimed that a cure resulted. This would seem to be good proof that organic disease can be relieved by nervous shocks like operations and faradic currents.

CASE 10. Æt. 2. Stumbles easily, slight talipes. Circumcision and adhesions removed. Marked improvement.

No proof that genital irritation acted as cause.

CASE 11. Boy, æt. 3. Unable to stand ; laryngismus stridulus. Circumcision. One week after could stand by a chair. "Improvement was continuous and rapid."

As length of time of observation is not given, no conclusions can be drawn.

CASE 12. Boy, æt. 1. Marked paresis whole left side, which is not as well developed as the right. Drags left foot in crawl

ing, and has had frequent convulsions. Circumcision and removal of adhesions. Electricity used. Three weeks later much better use of extremities, and "the improvement continued."

This looks very much like a case of organic disease benefited by circumcision and removal of adhesions, and electricity.

CASE 13. Boy, *æt.* 11. Urinary incontinence. Adhesions removed. No improvement.

Case requires no comment.

CASE 14. Boy, *æt.* 4. Severe talipes equino-varus. Tendo achillis cut, and foot brought into position. About four months after circumcision for an elongated prepuce, and adhesions removed. Brace and electricity, used improvement rapid and excellent.

Tenotomy, circumcision, removal of adhesions, brace, and electricity—who can tell to which was due the improvement?

CASE 15. *Æt.* 4. Incontinence of urine. Circumcision and removal of adhesions. Perfect relief.

How long was this relief maintained?

CASE 16. Boy, *æt.* 13. Convulsions almost continually; sometimes forty or fifty in the twenty-four hours; easily excited, and would occasionally be almost uncontrollable. Prepuce elongated and adherent. December 15, 1880, broke down adhesions. January 11, 1881, day attacks recurred very rarely, night attacks much less severe. Circumcision October 23, 1881. For a while after no convulsions for week or more at a time; then they returned occasionally at night, and for this bromide of potash was given. Now goes to school regularly, and excellent reports are given of his behavior and progress.

This seems to have been a case of organic disease improved by one operation which probably removed a genital irritation, then by another operation which is not said to have been necessary for genital irritation, and finally, by the bro-

mide; but yet, as this history must have been written in the early part of November, about a week or two after the last operation, and about the time it was found necessary to commence the bromide, the case contains no proof that the convulsions were due to the genital irritation or was improved by the operation.

CASE 17. Boy, *æt.* 6 weeks. "He had never had a good night's rest since his birth, and had to be drugged to secure the least rest. Cried almost incessantly night and day. Legs were in constant motion, penis was in a state of priapism. As soon as it was touched the convulsive movements were augmented in severity and rapidity." On crying, small tumors in each inguinal region. Circumcision. Three months after, the mother stated that she had not had a particle of trouble with the child from the second day.

As it is not stated that there was phymosis or adhesions in the case—as, therefore, there does not seem to have been any genital irritation—the case would seem to have been one of some central lesion, relieved, for three months at least, by an operation upon the genitals.

CASE 18. *Æt.* 10 weeks. Not a good night's rest since birth; cried or fretted almost constantly; in constant jactitation. Head thrown back on spine, and kept erect by handkerchief tied around belly. Urine accumulates under prepuce, and dribbles out through a small orifice. Circumcision. Every symptom disappeared, and had not returned three months later.

This would be good proof, were it not for the flaw lying in the fact that the case was only three months under observation.

CASE 19. *Æt.* 13. Paresis of lower extremities from birth, especially in left leg. Dizziness and pain in lumbar region; nocturnal urinary incontinence. Prepuce firmly adherent, almost to urethral mouth. Adhesions broken up. Disappearance of every symptom, except once incontinence, and no return nine months after.

This constitutes first-class proof, subject, however, to the same reserve as in the last case.

In none of these cases, therefore, is the proof conclusive that urinary incontinence or paresis is caused by genital irritation. A careful perusal of my own cases, as well as of the remarkable one which I have narrated from Dr. Mitchell's article, must convince any one that I am not captious in insisting upon the inadequacy of the length of time during which many of these patients were under observation. If we are to make medicine a true science and practice it as a veritable art, we can only do so by the most rigid application of rules of evidence, — far more rigid, indeed, than is usual in courts of law, for they base conclusions largely upon probabilities, and we can wait for certainties.

I cannot forbear from alluding to Dr. C. L. Dana's thoughtful paper in the issue of the same journal. It contains the histories of two little patients who presented, the one an urinary incontinence and general nervous symptoms, the other a paresis and slight wasting of left leg. In both there were phymosis and adhesions. The first was circumcised. A month after there was no change whatever. Cod. liver oil, iron, hot hip-baths, were ordered. Still no change nine days after; then "ordered complete change in diet, with larger amounts of food, oil, and lacto-phosphate of lime." Rapid recovery ensued in a few weeks, continuing for nearly two years, when he developed Pott's disease. In the second case the genitals were not touched, and the patient was treated with electricity, massage, nux vomica, and counter-irritants to the back. Twenty-four days afterward the little fellow had almost ceased to drag his foot, had much power over the limb, the electrical contractility, which had been slight, was better, appetite had returned, nervousness had greatly diminished. Of the significance of these cases there can be no doubt whatsoever.



